Integrated Water Quality and Aquatic Communities Protocol – Lakes and Ponds

Standard Operating Procedure (SOP) #12: Post-Site Tasks

Draft Version 1.0

Revision History Log:

Previous Version	Revision Date	Author	Changes Made	Reason for Change	New Version

This SOP details the necessary tasks for the field crew to do in between sampling of sites. This includes: (1) Disinfection of field gear; (2) Storage and shipping of water samples; (3) Data backup (photos, multi-probe data, GPS data); and (4) Tasks to prepare for the next day.

Prior to leaving the site, the crew must review each data sheet and electronic form for completion and accuracy and the crew leader must sign each page to verify that the data are complete.

In the event that a certain protocol was not doable, due to equipment failure, safety reasons, etc., an event log (Appendix F: Field Data Sheets, Training Logs) should be filled out prior to leaving the site.

Disinfection

It is the responsibility of the field crew to ensure that they do not participate in the transfer or spread of wildlife diseases or invasives species. To minimize the chance of disease spread, crews should switch out of hiking footwear before they approach the waterbody and switch to water wear (sandals, neoprene booties, or waders). This water footwear is then disinfected before going to another waterbody.

Gear is packed up at the water's edge prior to departure and is isolated from the environment in industrial strength trash bags. (**Gear should be scrubbed with a stiff brush prior to packing to remove excess debris.**) Disinfection is then carried out back at either the park housing or campground.

1. Start disinfection by preparing a treatment barrel and rinse barrel (13+ gallon trashcan).
    a. Prepare a 4% solution of bleach (Sodium hypochlorite). Standard household bleach (e.g., Clorox®) is 6.15%. This may vary depending on brand.

   b. Use the $c_1v_1 = c_2v_2$ formula to calculate the amount of bleach needed in the trash can to be diluted. In the case of commercial Clorox, with a final volume of 10 gallons, this is:

      (6.15%) x (initial volume) = (4%) x (10 gallons)

      Initial volume = 6.5 gallons

   c. Under the above scenario, 6.5 gallons should be poured in one of the trash cans, and 3.5 gallons of water should be used to dilute it to a final volume of 10 gallons.
2. Fill a second trash can with 10 gallons of tap water as rinse water.
3. Place gear in bleach water for 15 minutes. This must be timed and not estimated.
4. Rinse gear in tap water (in second trash can).
5. Allow to dry as thoroughly as possible before packing up again.
6. Used bleach solution must be brought back to a municipal sewage system, where it can be added to standard waste water and safely decontaminated using dilution of tap water. Two 5 gallon jugs are provided to return the bleach water from the park housing units to municipalities.

When the above protocol is not doable (e.g., the crew is camping at isolated areas) or the crew needs to disinfect expensive electronic gear (e.g., the multiprobe), an alternative procedure should be followed:

1. Using a household spray bottle, spray 70% Ethanol over the entire surface of the equipment.
2. Allow Ethanol to permeate the equipment for at least 1 minute.
3. Rinse with tap water and allow to dry (except for the multiprobe).

Gear to be disinfected includes all gear that came into contact with water when sampling, including but not limited to: waders, boots, sandals, nets, boats, paddles, water sampling gear, Secchi disks, etc.

Sample Storage and Shipping

Storage

Upon return to the crew housing, the samples should be stored as follows:

Dissolved Organic Carbon: placed in a refrigerator at 4° C, in a dark container.
Filtered Water sample: placed in a freezer at -18° C in the dark.
Chlorophyll a *filters*: placed in a freezer at -18° C in the dark.
Zooplankton and Macroinvertebrate samples: No special storage necessary, but should be organized and stored in plastic storage bins.

Although the crew should have ensured that labels were adequately attached, accurate, and followed the protocols, the crew should double check labeling at this time too.

SOP #12: Post-Site Tasks (continued).

Shipping

It is the responsibility of the Project Lead to arrange for the shipping of samples to contract laboratories. Depending on the requirements of the contract laboratories, zooplankton and macroinvertebrate samples may be held until the field season has ended. Shipping of samples sooner may be desired if the laboratory can improve upon sample turn-around time.

Water samples must be shipped throughout the project so that sampling holding times are minimized. Most water samples can only be held for a maximum of 28 days before the quality control issues arise and EPA regulatory holding periods are exceeded (APHA 2005).

Shipping preferences will vary depending on the contract laboratory. The basic protocol below is for the contract laboratory used for the pilot project, the Cooperative Chemical Analytical Laboratory, based at Oregon State University.

1. When shipping samples, time is of the essence (e.g., do not start sample preparations on a Friday. Instead, do it on a Monday morning, so you can ship it that afternoon and the receiving lab can get it on Tuesday morning.). Also, confirm with the lab that someone will be there to receive the samples and that they are ready for them to arrive.
2. Start by ensuring that all samples to be shipped out are present and properly labeled.
3. Prepare a sample inventory sheet to provide to the laboratory, both included in the package and for electronic delivery:

NPS LAVO Lake Pilot Project 2008

Sample no.	Lake Name	Date (YYYYMMDD)	Type	County	State
1	Reflection Lake	20080909	filtered water deep	Shasta	California
2	Reflection Lake	20080909	filtered water shallow	Shasta	California
3	Cluster Pond 4	20080910	filtered water deep	Shasta	California
4	Cluster Pond 4	20080910	filtered water shallow	Shasta	California
5	Summit Lake	20080911	filtered water deep	Shasta	California
6	Summit Lake	20080911	filtered water shallow	Shasta	California
7	Cluster Lake 4	20080917	filtered water	Shasta	California
8	Little Bear Lake	20080917	filtered water deep	Shasta	California
9	Little Bear Lake	20080917	filtered water shallow	Shasta	California

Samples were collected with a horizontal Van Dorn bottle. Samples labeled shallow were taken 0.5 m below the surface of the lake, and samples labeled deep were taken 0.5 m above the bottom of the lake. If there is no "deep" or "shallow", then there was only a single midpoint sample taken. All samples were filtered through a 0.45 micrometer nylon membrane filter.

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4. This inventory includes contact information, lake name, dates, type of sample, and sampling information. A sample number is assigned and added (1 – 9, above), to allow the lab and Network to ensure that there is no confusion about what sample is what.
5. Secure a label to each bottle with the sample number, ensuring that the label is on the right bottle.
6. Wrap the bottle or vial lid with parafilm or electrical tape to ensure a tight seal. Place these within a large zip seal type plastic bag.
7. Using blue ice packs to keep the samples cold, place the samples in a medium sized ice chest (e.g., a 48 quart). Place the frozen filtered water samples on the bottom, and then layer some newspaper or cardboard in between the frozen samples and the refrigerator (i.e., non-frozen) dissolved organic carbon samples.
8. When packing the dissolved organic carbon samples (in glass vials), add some padding around the vials to prevent breakage.
9. Print out a copy of the sample inventory sheet, place it in a zip seal type plastic bag, and place on top of the sample (so that it is the first thing the receiving lab will see). **Include a chain-of-custody form, detailed below (included in Appendix F: Field Datasheets, Logs).**
10. Seal the ice chest with packing tape for a secure seal.
11. Use an express carrier (e.g., UPS or Fed-Ex) to send the package **overnight**. If shipping from a university, ensure that the package is delivered to the mail room prior to the carrier pickup. The drop-off point should planned out in advance, so that the crew or Project Lead is not searching for one at the last minute.
12. If packing and shipping is done by the crew leader, it is the responsibility of the Project Lead to provide the crew leader with either pre-paid shipping labels or an account code to charge the shipping to.
13. After shipping, the Project Lead must follow-up with the recipient to ensure that the samples were safely delivered and received with no loss of sample integrity. Shipping and tracking numbers should be retained to facilitate any follow-up.

The shipping of zooplankton and macroinvertebrate samples are similar to the shipping of water samples. **However, the shipping of Ethanol (a flammable material) is regulated by the Department of Transportation; shipping of undeclared Ethanol is a federal offense.** The regulated shipping of Ethanol is permissible, if the shipper (the Project Lead) is certified through a Department of Transportation training program and special procedures are followed.

A safe, legal work-around to shipping Ethanol is as follows:

1. Prior to shipping, pour off the majority of the Ethanol in the shipping vial (generally 80 to 90 % of the Ethanol). Use a sieve to ensure that no specimens are lost.
2. Replace with tap water.
3. Include a letter to the laboratory, clearly stating "**stored in water – replace with Ethanol upon receiving.**"
4. Warn the lab staff that the incoming samples will need Ethanol replacement and ensure that the samples are sent **overnight**.
5. As with the water samples, send so that they arrive on a working day, when staff will be present to replace the water with Ethanol.

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When shipping invertebrate samples (legally with Ethanol, if a certified shipper is known, or by replacing Ethanol with water), use the following guidelines:

- Ship in a hard plastic container (e.g., ice chests).
- Wrap vials with Parafilm or vinyl electrical tape.
- After wrapping with Parafilm, put vials in a zip seal bag.
- Include absorbent material in the vial and packaging in case of breakage.
- Fill out and include a chain-of-custody form (in a waterproof bag, Appendix F.)
- Redundancy is good.

Chain-of-Custody Form (adapted from the Greater Yellowstone Network [O'Ney 2005])

A chain-of-custody form will document the collection and transfer of all samples originating from this protocol. The end purpose is to assure that an accurate written record is created by the field crew that will be accepted as valid evidence to trace a sample or samples from the moment of collection through laboratory testing and reporting of test results.

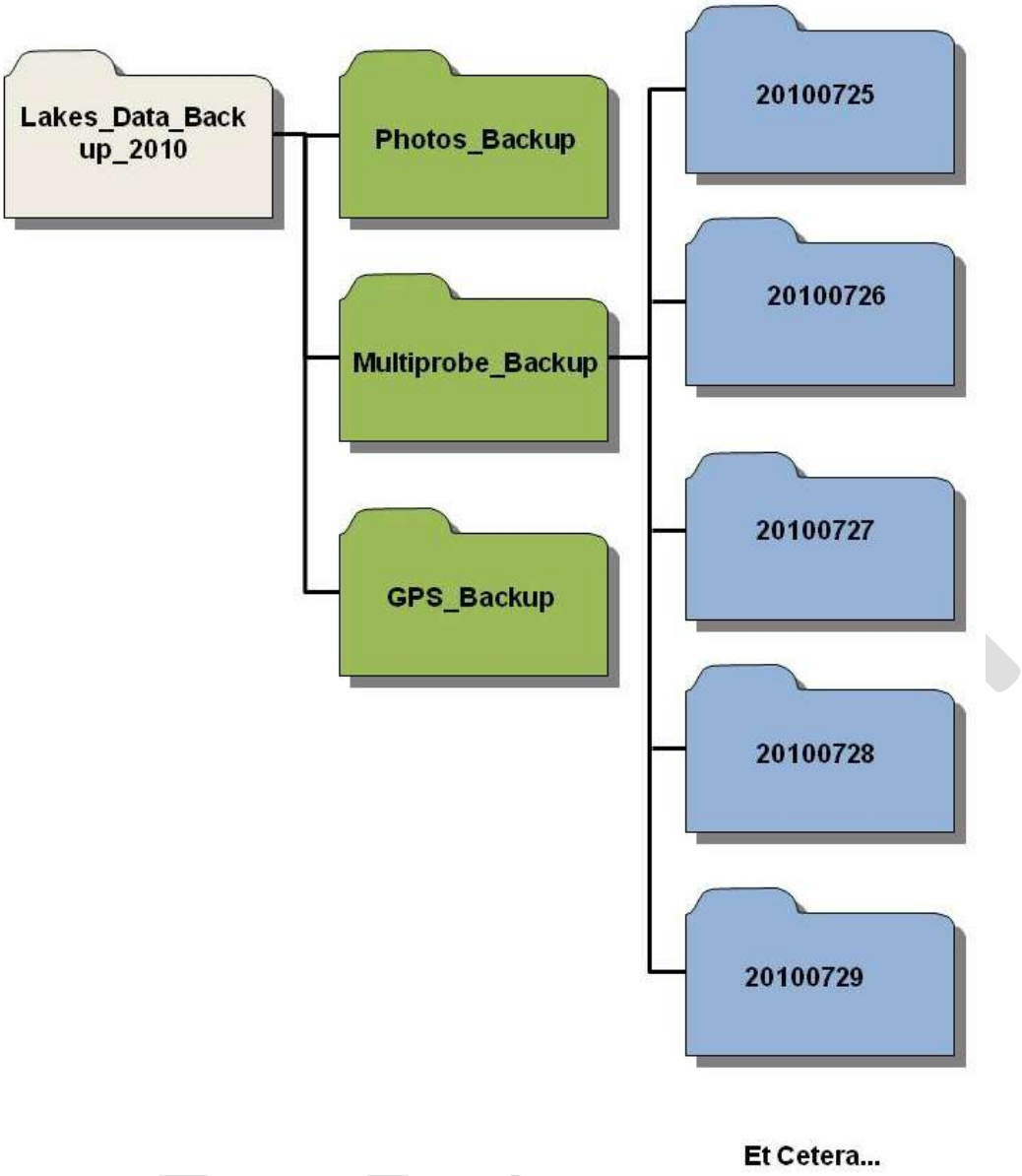
When shipping samples, the form must be completed and attached to the sample inventory sheet (as above, in a waterproof bag). The Project Lead, shipping the samples, retains a shipping receipt as proof of transfer of custody. Laboratory personnel receiving the samples indicate date and time received upon sample arrival. The original forms are scanned and retained, along with all other logs.

Some aspects of the chain-of-custody form replicate the sample inventory form but should be included on both sheets for regulatory purposes.

Data Back-up

Upon returning to the crew housing, all electronic data should be backed up onto a Network laptop. This includes digital photos, multiprobe data, electronic databases, and Trimble GPS data. Prior to field crew deployment, the Project Lead should preload the laptop with the following hierarchical file structure. This file structure should start within the folder: C:\Documents and Settings\My Documents\Lakes_Protocol.

SOP #12: Post-Site Tasks (continued).



The file of the first hierarchical folder (Lakes_Survey_2010) should be adjusted from field season to field season, with the current year forming the last four digits. The folders for the third level (e.g., 20100725, 20100726) follow the date format of yyyymmdd. Every day that has a field sampling activity should have a representative folder within each type of data.

Note that backing up the files *does not include any renaming of files*!

Photos

The digital photos taken for the day should be downloaded after every field visit. Using Windows Explorer, the photos from the camera (connected to the computer using the camera's download cable) should be copied (using shift-left click function to highlight the photos, followed by a right click and selecting "copy") to copy the entire set of the day's photos.

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The destination folder should then be opened up in the file structure, ensuring that it is within the Lakes_Survey_yyyy and Photos_Backup with the correct date folder. The photos should then be pasted within the date folder (e.g., 20100725). Keep in mind, photographs from previous days will be on the camera and care should be taken to only back up photographs from that day's surveys. **A double check that the correct files were copied into the correct destination should follow.** The camera can then be disconnected using the "Safely Remove Hardware" function of Microsoft Windows.

Multiprobe Data

The Sonde multiprobe data should be backed up in a similar fashion to the photos.

The *Amphibian* should be connected to the laptop computer via a USB download cable supplied to the field crew. Upon connecting, the iPaq PDA should be auto-detected using Microsoft ActiveSync. For the purposes of downloading the multiprobe data, the ActiveSync functions can be ignored and canceled out of.

Using Windows Explorer, click on the device labeled "Mobile Device" under "My Computer." This will access the files on the PDA. Under the file folder, "My Documents\Eureka," copy the .loc file (this is known as a "location" file for the amphibian unit) and copy and paste into the "Multiprobe_Backup" folder of the appropriate date. At this point, the crew member should ensure that there are data within this file, done by checking that the file size is greater than 0 KB.

GPS Data

The details on backing up GPS data are also provided in SOP #11: Amphibian, Invertebrates, and Lake Substrate Walk-around, but are also summarized here.

Make certain you have ActiveSync on the computer where you plan on backing up the data and follow the steps below to back up the data.

1. Connect the Trimble cradle to the computer and place the Trimble unit in the cradle.
2. ActiveSync should start automatically and will let you know when the computer and the Trimble unit are connected.
3. On the computer, open Windows Explorer and look for the Trimble icon that is labeled "Mobile Device" (Figure 3). Double click on the mobile device.
4. Go to the following pathway:
   My Windows Mobile-Based Device\Lakes_Study_2010
5. Right click on the folder called "Shapefiles" and select "copy."
6. Go to the location you plan on storing the backup file (the dated folder 20100725, for example, within the GPS_Backup folder).
7. Right click on the appropriate folder and select "Paste."

An alternative, using a "Secure Digital" card (better known as SD cards) can be used by the crew. If the Trimble is equipped with an SD card, transfer the "Shapefiles" folder to the card using the PocketPC mobile Windows Explorer, then eject the card and, using an external card reader or internal drive (if laptop has one), copy the "Shapefiles" folder to the dated folder (e.g., 20100725) in the GPS_Backup folder. Replace the SD card back in the Trimble.

SOP #12: Post-Site Tasks (continued).

Tasks for the Next Field Day

The field crew, collectively, should do the following:

1. Check consumables and replace field kits/backpacks with necessary supplies, such as filters, latex gloves, water bottles, foil for Chlorophyll *a*, data sheets, etc.
2. Batteries should be recharged, including but not limited to: Icom Radio, Amphibian data logger, GPS units (Trimble and Gamin, if applicable), camera, headlamps, and tablet PCs.
3. Review the field folder for the next day's site. If a repeat Index site, they should look over the photos, field conditions, and access time required by previous crews. If a new site, they should review maps and access routes to plan for the following day.

Literature Cited

O'Ney, S. E. 2005. Regulatory water quality monitoring protocol, Standard Operating Procedure #7: Quality assurance/quality control procedures. National Park Service, Greater Yellowstone Network, Bozeman, MT.

Project: Klamath Inventory and Monitoring Lakes Project Lead: Phone: Address: Fax: Email:

Park(s):
Shipped via: Fed-Ex UPS USPS
Tracking Number:

Field Crew:

Sample (may refer to an attached inventory sheet)	Date Sampled (yyyymmdd)	Time sampled (24 hour format)	Site Name	GRTS Code	Type (Filtered water, Dissolved Organic Carbon, Invertebrates, Zooplankton, Chlorophyll a)

Name and Position	Date/time received	Location received (i.e. Lab name)	Date/time relinquished	Location delivered/sent to:	Signature